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U. S. Army Aviation Epidemiology Data Register: Trends in the Age Distribution of Army Aviators Stratified by Gender and Component, 1986 to 1992

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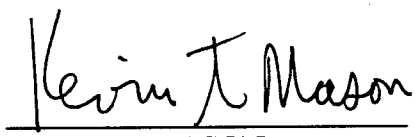

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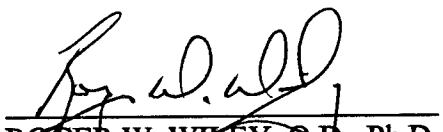

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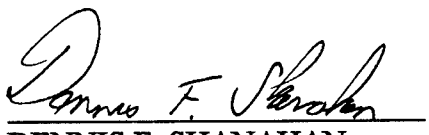

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19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)
The Aviation Epidemiology Data Register was queried to analyze the age distribution of Army aviators for the period 1986 through 1992. Detailed reference tables were published separately. This report summarizes the findings extracted from the reference tables and subjects data to statistical analysis.

There has been a significant aging of the Army aviator population from 1986 through 1992, whatever the component of service. Most of the aging effect is seen in the cohort of aviators age 40 and older. This trend is due likely to a marching cohort of Vietnam-era aviators who are approaching military retirement age. Female aviators are significantly younger than their male peers. This finding is due likely to the recent recruitment of women into Army aviation during the 1980's. A bimodal curve exists in the age distribution of Army aviators. This finding is due likely to trends in Army force structure during the Vietnam War build up, followed by post-Vietnam force reduction, and followed by 1980's cold war build up. Now the Army is undertaking another force reduction in this decade.

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19. Abstract (Continued).

Aeromedical planners need to be aware of Army aviator force structure changes and age distribution plans. Aging aviators have unique preventive medicine and disease detection needs not required in younger populations. Each component has different capabilities in responding to the health care needs of Army aviators. Increasing numbers of older aviators might over burden some Army aviation health care systems. Fortunately, the trend in Army aviator aging is decelerating.

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Military relevance

A Department of Defense report on selected manpower statistics for fiscal years 1980 through 1989 showed the median age of male active duty service members increased by 2 years. The data was not stratified by occupation or branch of service (Department of Defense, 1989). Age is a common confounding variable in many Aviation Epidemiology Data Register (AEDR) studies. Therefore, monitoring trends in the age distribution of Army aviators is an essential requirement that supports our chronic disease and injury studies.

The study of cardiovascular diseases among Army aviators is of current interest to AEDR researchers. These conditions are a major cause of morbidity and mortality in aviators and the general population. These conditions are associated, in part, with increasing age. A 2-year shift in Army aviator age, as noted above in the general Army population, might alter significantly the risk for developing age related conditions among aviators.

As an example of the potential effect, we reported that 14.6 percent of active duty aviators were 40 to 45 years old in 1988 (Schrimsher and Shannon, 1993). The cardiovascular disease mortality rate for white males, age 40 to 45, is 47 per 100,000 per year (U.S. Department of Health and Human Services, 1991). If we assume these rates are valid for aviators, we estimate that there would be 0.812 deaths per year among aviators due to cardiovascular disease in this age group. If the aviator population was only 2 years younger, only 8.6 percent of the population would be 40 to 45 years old, resulting in 0.485 cardiovascular deaths per year. These data show that significant differences in cardiovascular disease mortality could result from slight shifts in the age distribution of a population.

Aviation Epidemiology Data Register

We extracted data from the AEDR. The AEDR is maintained jointly by the U.S. Army Aeromedical Center and U.S. Army Aeromedical Research Laboratory, Fort Rucker, Alabama. This was directed by the Army Surgeon General according to Army Regulation 40-501, Medical fitness standards, Chapter 6 (Department of the Army, 1994). Army aviators undergo an annual flying duty medical examination (FDME). USAAMC reviews all FDMEs centrally at Fort Rucker. Contract personnel (Prime Technology, Incorporated) extract demographic, occupational, and medical information from each FDME using a standardized protocol. In 1992, the AEDR contained over 300,000 records representing more than 78,000 individuals.

Methods

Selection criteria for AEDR records were Class 2 (aviator) with examination date between January 1, 1986, and December 31, 1992. In the U.S. Army, the term "aviator" refers to pilots only, and does not include navigators or weapon systems officers. After extracting the data, we sorted the file by examination date and Social Security number (SSN), retaining only the last record for each

SSN during each calendar year. The final database, after deleting multiple records for any SSN in a calendar year, contained 149,348 records.

Age was computed based on the difference between date of birth and date of examination for each completed FDME. The records were stratified by age, calendar year, component of U.S. Army service, and gender. Compiled, detailed reference tables for each calendar year were published separately (Mason and Shannon, 1994a). Components of service included active duty, Army Reserve, to include Individual Ready Reserve (USAR), Army National Guard (ARNG), and civilian pilots flying Army aircraft (CIV). We counted civilians who were serving also in the USAR or ARNG as being in their USAR or ARNG component, rather than being in the civilian component. Analyses were computed using SAS® PROC FREQ (SAS Institute, 1994).

Results

About 58 percent of any calendar year's cohort of aviators were on active duty, 28 percent were in the ARNG, 11 percent were in the USAR, and 3 percent were in civilian service. Table 1 provides a breakdown of the records by military component and gender for each of the 7 calendar years in the study.

Table 1.
Distribution of Army aviators by calendar year, component, and gender.

Calendar year	Active duty		USAR		ARNG		CIV	
	Male	Female	Male	Female	Male	Female	Male	Female
1986	12169	204	1693	22	4619	44	430	4
1987	13054	323	2674	61	5626	73	659	7
1988	12380	321	2751	82	6115	80	680	8
1989	12187	327	2570	77	6138	95	691	7
1990	12074	319	2473	69	6103	106	679	7
1991	12439	330	2003	66	6126	96	626	8
1992	11116	306	1779	62	5727	107	549	7

In the mid year of the study, 1989, the ages of Army aviators ranged from 18 to 67. Table 2 shows the first through third age quartiles stratified by component. USAR, ARNG, and civilian aviators were older than active duty aviators. ARNG and civilian aviators were older than active duty and USAR aviators. Civilian aviators were older than active duty, USAR, and ARNG aviators. Figure 1 shows male aviators were significantly older than female aviators (Kolmogorov test statistic, one-tailed, $p<0.001$).

Table 2.
Age quartiles by component in 1989.

Age quartile	Active duty	USAR	ARNG	CIV
First (25th percentile)	28	30	31	40
Second (50th percentile)	32	37	39	45
Third (75th percentile)	39	42	43	50

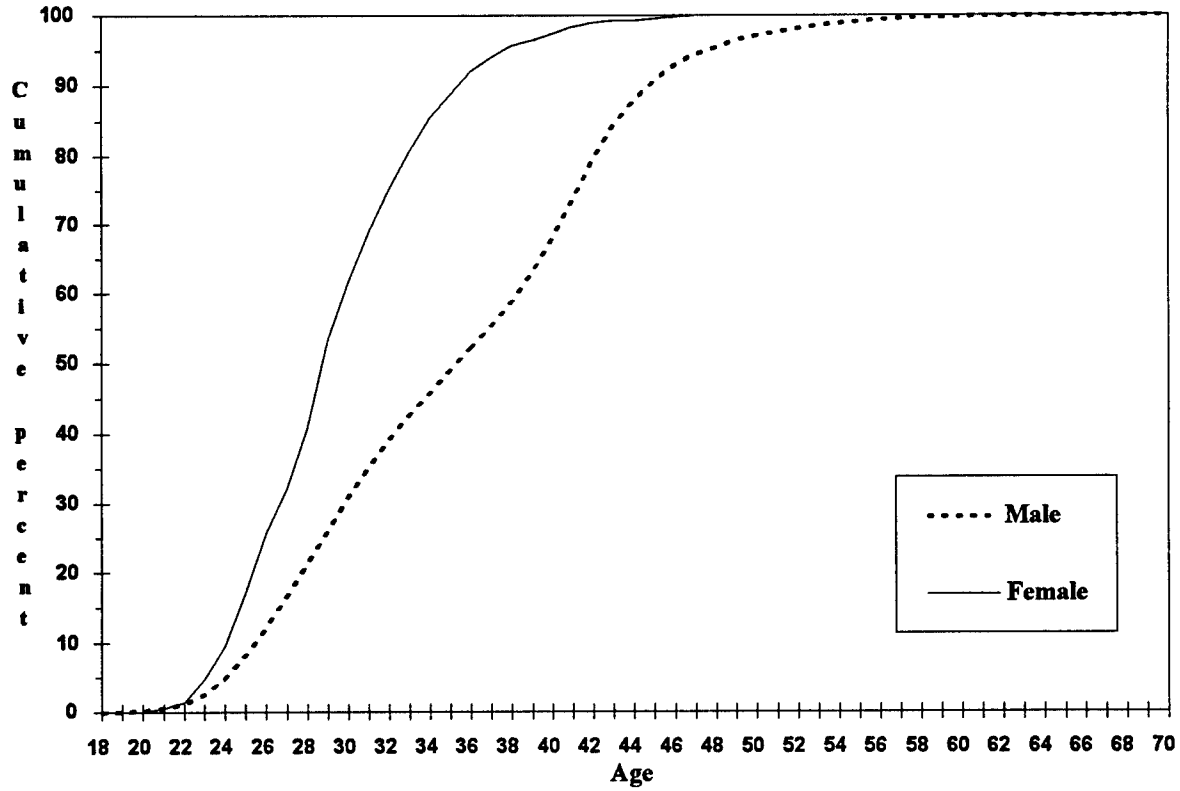

Figure 1. Gender-specific difference in Army aviator ages, 1989.

Table 3 shows the observed proportion of male Army aviators who were age 40 or older by component and calendar year. Each component had a significant increase in the proportion of male aviators age 40 and older from calendar year 1986 through 1990 (comparison of proportions with continuity correction, one-tailed, $p<0.001$). The trend decelerated for military male aviators from 1990 through 1992. For civilian aviators, the trend continued through 1992. In contrast, the active Army as a whole had only 8 percent of the population age 40 or older in 1988 (Department of Defense, 1989).

Table 3.
Observed proportion of male Army aviators age 40 or older by component and calendar year.

Component	1986	1988	1990	1992
Active duty	14.48% ±0.63%*	19.24% ±0.69%	20.67% ±0.72%	20.09% ±0.75%
USAR	22.45% ±1.99%	34.13% ±1.77%	43.47% ±1.95%	43.11% ±2.30%
ARNG	31.39% ±1.34%	43.09% ±1.24%	48.88% ±1.25%	45.73% ±1.29%
CIV	60.47% ±4.62%	75.15% ±3.25%	80.17% ±2.97%	86.16% ±2.89%

* This is the 95 percent, two-tailed, confidence interval of the proportion.

As shown in Figure A-1, the age distribution of active duty males in 1986 had two peaks, one at age 27, and a second at age 39. By 1988, the second peak in the age distribution was shorter and had shifted to the right by 2 years. This trend continued in 1990, but the second peak was nearly eliminated by 1992. From 1986 through 1990, the area under the second peak increased. This was caused by the increase in the number of Army aviators over age 39. Figures A-2 and A-3 show similar trends in the male USAR and ARNG aviator cohorts, with the exception that the second peak is preserved into 1992 than the active duty cohort. The marching cohort effect is most prominent in the second peak of Figure A-3 for male ARNG aviators.

Discussion

This study confirms several of our suspicions about proportions and trends in age distribution of Army aviators. First, female Army aviators are significantly younger than their male peers. The Army did not train female aviators until 1973. It was not until the mid-1980s that they entered the Army aviator work force in greater numbers. A majority of the female cohort has not been in Army

aviation service long enough to reach retirement age. Complicating this finding is that we have confirmed female aviators are at increased risk for attrition from aviation service after their initial service obligation (Shannon, Mason, and Harper, 1994; Mason, Shannon, and Harper, 1994).

Second, civilian aviators are older than ARNG aviators, who are older than USAR aviators. Active duty aviators are the youngest. Many aviators who leave active duty before retirement transition to the USAR and ARNG work force. They serve as "weekend warriors" or as state-employed cadre in military service in a stable cohort of peer aviators, living in the same communities. Many fly in their local reserve component units until age 60. Of the career active duty aviators, some transition to flying for the Army in a civilian capacity after retirement from active duty. Several of these civilians have flown Army aircraft up to the age of 72.

Third, male Army aviators are significantly older in 1992 than in 1986 in all components of aviation service. Much of the aging effect occurs in the marching cohort documented by this study, that is, in the group older than age 40. This trend may explain the increasing rates of aeromedical boards, increasing rates of diabetes mellitus, impaired glucose tolerance, refractive error, and herniated nucleus pulposus observed during the study period (Mason, 1990; Mason and Shannon, 1994b; Mason, Shannon, and Schrimsher, 1993; Mason, 1994).

This study unveils a bimodal curve in the age distribution of male Army aviators. The second, right-hand peak in the age distribution curves is the result of a marching cohort of Vietnam-era trained aviators. The trough between the first and second peaks is likely the result of post-Vietnam war force reductions that occurred in the mid-1970s into the early-1980s. A decade from now, another marching cohort of military aviators may emerge from the Cold War military build up of the 1980s, followed by a trough generated by the post-Cold War force reduction of the 1990s.

Conclusions

There has been a significant aging of the Army aviator population from 1986 through 1992, whatever the component of service. Most of the aging effect is seen in the cohort of aviators age 40 and older. This trend is due likely to a marching cohort of Vietnam-era aviators who are approaching military retirement age. Female aviators are significantly younger than their male peers. This finding is due likely to the recent recruitment of women into Army aviation during the 1980s. A bimodal curve exists in the age distribution of Army aviators. This finding is due likely to trends in Army force structure during the Vietnam War buildup, followed by post-Vietnam force reduction, and followed by 1980s Cold War buildup. Now the Army is undertaking another force reduction in this decade.

Aeromedical planners need to be aware of Army aviator force structure changes and age distribution plans. Aging aviators have unique preventive medicine and disease detection needs not required in younger populations. Each component has different capabilities in responding to the health care needs of Army aviators. Increasing numbers of older aviators might over burden some Army aviation health care systems. Fortunately, the trend in Army aviator aging is decelerating.

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Appendix A.

Tables for serial changes in age distribution of male Army aviators.

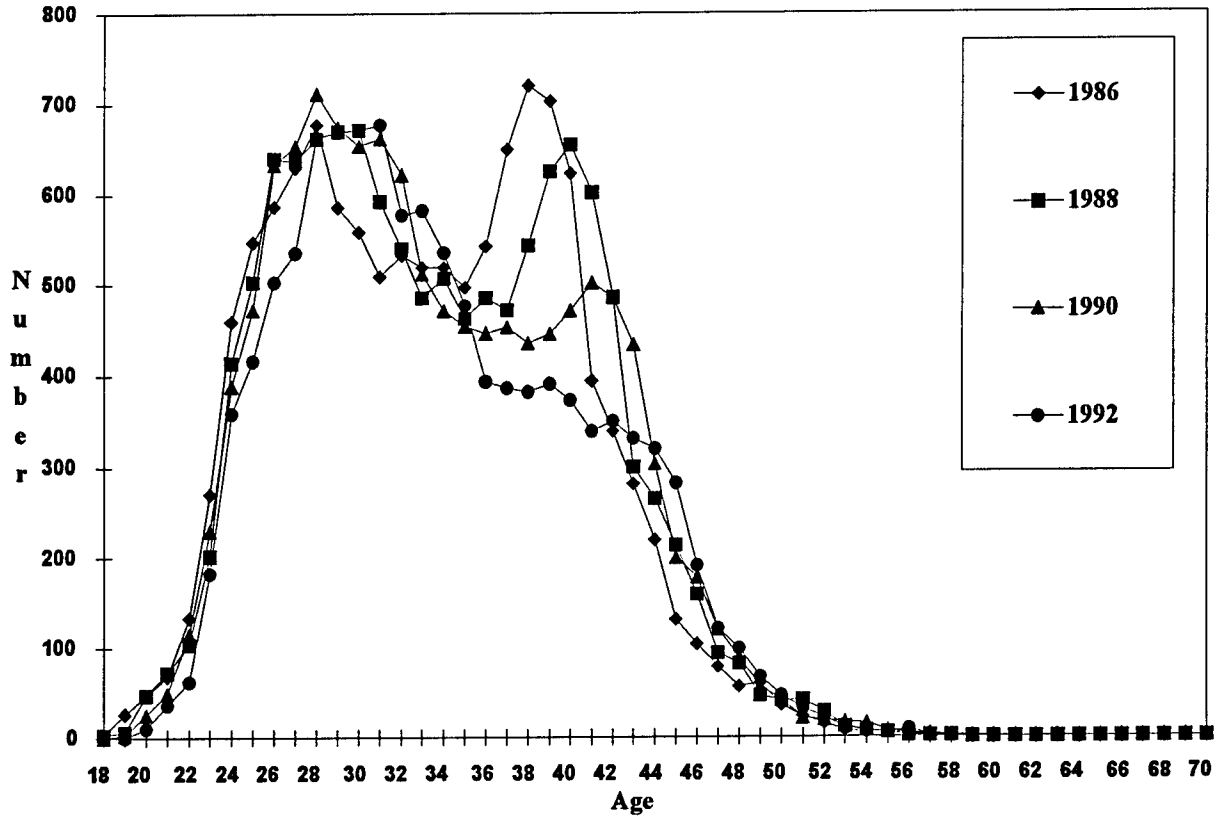

Figure A-1. Serial changes in the age distribution of male, active duty aviators, 1986 to 1992.

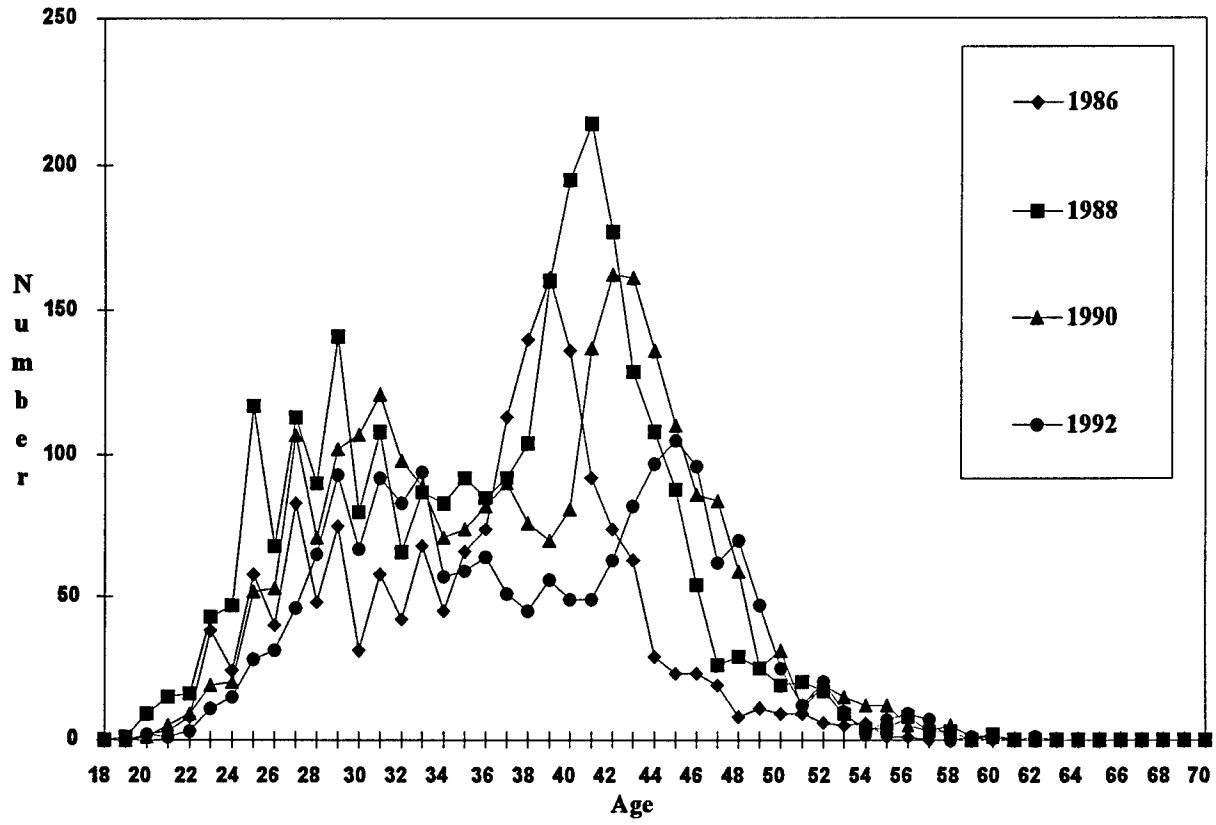

Figure A-2. Serial changes in the age distribution of male, USAR aviators, 1988 to 1992.

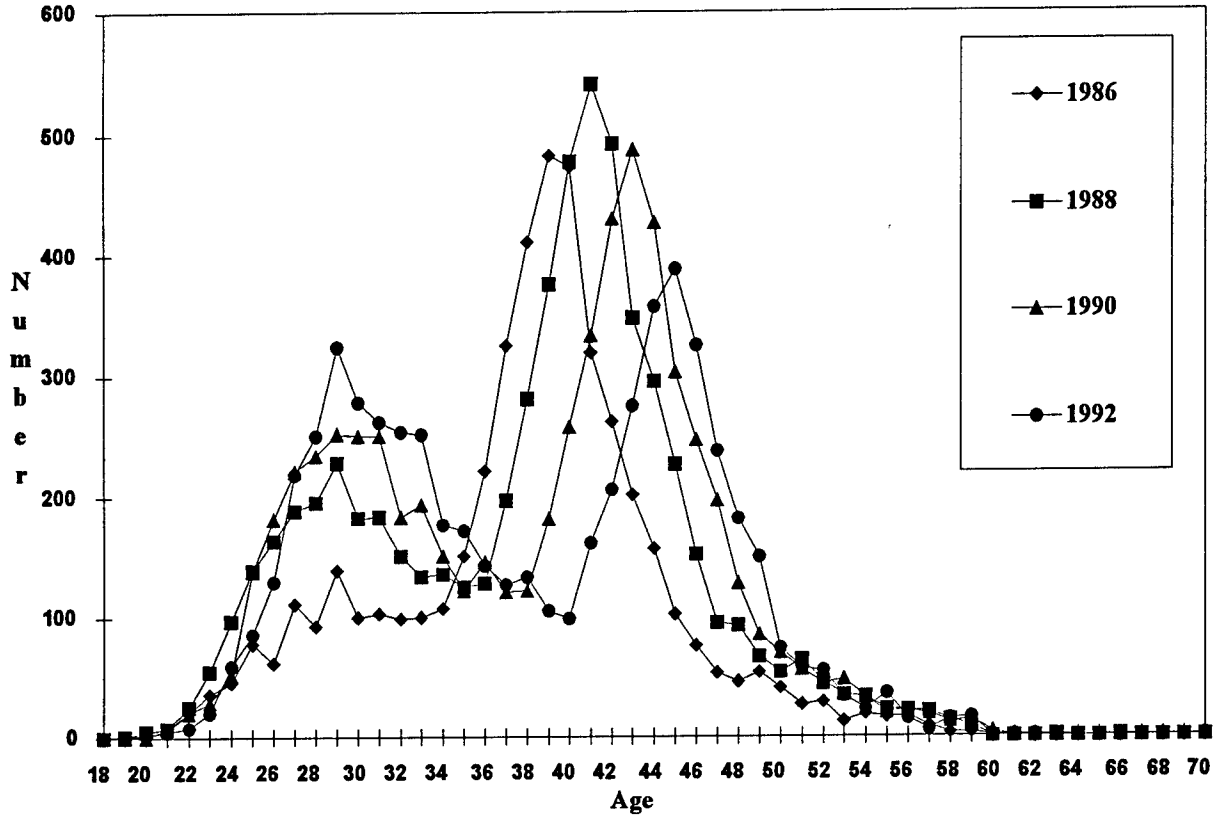

Figure A-3. Serial changes in age distribution of male, ARNG aviators, 1988 to 1992.

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